

Work Order ID 85370

85370

Page 1

June-07-12 9:18:12 AM

Item ID: D412-664-203

Accept

N900040100

Setup Start ***NS1***

Revision ID:

Stop ***NS2***

Item Name: Crosstube Aft

Start Date: 07/06/2012 Start Qty: 1.00

1

Cust Item ID:

Required Date: 21/06/2012 Req'd Qty: 1.00

1

Customer:

Reference:

Approvals: Process Plan: MLJ

Date: 12/06/07 Tooling:

Date:

Run Start ***NR1***

QC:

Date: SPC (Y/N):

Date:

Stop ***NR2***

| Sequence ID/ Work Center ID | Operation Description | Set Up/ Run Hours | Tool ID | Tool # | Plan Code | Accept Qty | Reject Qty | Reject Number | Insp. Stamp |
|--------------------------------|--------------------------|----------------------|---------|--------|--------------|---------------|---------------|------------------|----------------|
|--------------------------------|--------------------------|----------------------|---------|--------|--------------|---------------|---------------|------------------|----------------|

Draw Nbr

Revision Nbr

D412-664-243

E/DEO

100

0.00

100

DOCUMENT CONTROL

DC

Memo

0.00

Document Control

Photocopy bluefile and create labels as per PPP D412-664-203 CHG 008

110

0.00

110

Packaging

Packaging

Memo

0.00

Packaging

120

0.00

120

BENDING MACHINE - CROSSTUBES

CNC Bend 2

Memo

0.00

CNC Alpha 160 Bender

Bend tube as per Dwg D412-664-243 using CNC bender program 412-aft and Folio FT010

Handwritten: JG for MLJ 12-7-18

Handwritten: JW 12-6-12

Handwritten: JW 12-6-13

W/O: 85370

WORK ORDER CHANGES

| DATE | STEP | PROCEDURE CHANGE | By | Date | Qty | Approval Chief Eng / Prod Mgr | Approval QC Inspector |
|------|------|------------------|----|------|-----|-------------------------------------|--------------------------|
| | | | | | | | |
| | | | | | | | |

 Part No: D412-664-203 PAR #: _____ Fault Category: _____ NCR: Yes ☐ No ☒ DQA AK Date: 12/07/24

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

| NCR: | | WORK ORDER NON-CONFORMANCE (NCR) | | | | | | |
|---------|------|--|-----------------------------|---------------------------------|----------------|-----------------------------|-------------------------|----------------------------|
| DATE | STEP | Description of NC Section A | Corrective Action Section B | | | Verification Section C | Approval Chief Eng | Approval QC Inspector |
| | | | Initial Chief Eng | Action Description Chief Eng | Sign & Date | | | |
| 12/6/13 | 120 | CRUSHING AFTER BENDING IS OVER TOLERANCE. | CP 12/4/13 | ACCEPTABLE PER ATTACHED SR | N/A | DAS 15 2-3 17/4/20 | CP 12/6/13 PS1042 | DAS 15 2-3 7/2/20 |
| | | | | | | | | |
| | | | | | | | | |

NOTE: Date & initial all entries

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Required Date: 21/06/2012 Req'd Qty: 1.00 ***1***

Customer:

Reference:

| | | | | | |
|------------|---------------|-------|------------|-------|------------------------|
| Approvals: | Process Plan: | Date: | Tooling: | Date: | Run Start *NR1* |
| | QC: | Date: | SPC (Y/N): | Date: | Stop *NR2* |

| Sequence ID/ Work Center ID | Operation Description | Set Up/ Run Hours | Tool ID | Tool # | Plan Code | Accept Qty | Reject Qty | Reject Number | Insp. Stamp |
|--------------------------------|--------------------------|----------------------|---------|--------|--------------|---------------|---------------|------------------|----------------|
|--------------------------------|--------------------------|----------------------|---------|--------|--------------|---------------|---------------|------------------|----------------|

130 QC15- Crosstube Dimensional Check

0.00

130

QC

Memo

0.00

Quality Control

140

0.00

140

Crosstubes

Crosstubes

Memo

0.00

Crosstubes

1-Drill pilot holes in tube as per Dwg D412-664-243 using drill Jig DT8550 & DT8551 and drill table DT8577 using #9 holes as per QSI 10 to install towers.

2-Ream hole to finish size in tube as per Dwg D412-664-243 using drill Jig DT8550 & DT8551. Check dimensions between holes, both sides on both cuffs, to ensure alignment with saddle holes.

3-SCRIBE PART # & BATCH #

4-Deburr & Inspect for surface damage. Repair damage within limits as per Dwg D412-664-243

mo

12-6-14

TW

12-6-18

| W/O: | | WORK ORDER CHANGES | | | | | |
|------|------|--------------------|----|------|-----|-------------------------------------|--------------------------|
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Required Date: 21/06/2012 Req'd Qty: 1.00

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Customer:

Reference:

Approvals: Process Plan: Date: QC: Date:

Tooling: Date: SPC (Y/N): Date:

Run Start *NR1* Stop *NR2*

| Sequence ID/ Work Center ID | Operation Description | Set Up/ Run Hours | Tool ID | Tool # | Plan Code | Accept Qty | Reject Qty | Reject Number | Insp. Stamp |
|---|---|----------------------|---------|--------|--------------|---------------|---------------|------------------|----------------|
| 150 191 *150* HandFXtube Hand Finishing Crosstubes | Crosstubes Chemical Conversion Memo | 0.00 0.00 | | | | | | | |
| 160 192 *160* QC Quality Control | QC1 Inspect Part Finish Memo | 0.00 0.00 | | | | | | | |
| 170 *170* QC Quality Control | QC5- Inspect part completeness to step on W/O Memo | 0.00 0.00 | | | | | | | |

12-7-6 7107

1207 00 01 7105

Enrolle

| W/O: 85370 | | Perm. Change | | | | | | WORK ORDER CHANGES | | | |
|------------|------|--|----|------|-----|-------------------------------------|--------------------------|--------------------|--|--|--|
| DATE | STEP | PROCEDURE CHANGE | By | Date | Qty | Approval Chief Eng / Prod Mgr | Approval QC Inspector | | | | |
| 12/16/18 | #150 | More step ^{after} on # 190. App Qc 7 Due to corrosion issue. | | | | | <i>S. J. Wells</i> | | | | |
| | | | | | | | | | | | |

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Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

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Page 4

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Required Date: 21/06/2012 Req'd Qty: 1.00

1

Customer:

Reference:

Approvals:

Process Plan:

Date:

Tooling:

Date:

Run Start ***NR1***

QC:

Date:

SPC (Y/N):

Date:

Stop ***NR2***Sequence ID/
Work Center IDOperation
DescriptionSet Up/
Run Hours

Tool ID

Tool #

Plan
CodeAccept
QtyReject
QtyReject
NumberInsp.
Stamp

180

Outsource process - NDT per QSI038 4.1

0.00

180

Outsource2

Memo

0.00

Outsource process - NDT

Liquid Penetrant Inspection as per QSI 038Or
Issue P/O: 17258 LPI as per ASTM 1417
Level 2 Attach copy of NDT results to work order

CY 12/06/19 @

190

Packaging

0.00

190

Packaging

Memo

0.00

Packaging

Inspect for transit damage
Ensure copy of NDT results attached to work order.

12/06/19 @

200

QC5- Inspect part completeness to step on W/O

0.00

200

QC

Memo

0.00

Quality Control

Inspect for damage & ensure results are as per Dwg D412-664-203

12.06.19

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|------|------|--------------------|----|------|-----|-------------------------------------|--------------------------|
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Page 5

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Start Date: 07/06/2012 Start Qty: 1.00

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Cust Item ID:

Required Date: 21/06/2012 Req'd Qty: 1.00

1

Customer:

Reference:

Approvals:

Process Plan:

Date:

Tooling:

Date:

Run Start ***NR1***

QC:

Date:

SPC (Y/N):

Date:

Stop ***NR2***Sequence ID/
Work Center IDOperation
DescriptionSet Up/
Run HoursTool ID Tool # Plan
CodeAccept
QtyReject
QtyReject
NumberInsp.
Stamp

210

0.00

210

SprayPaint

SprayPaint

Memo

0.00

Spray Painting

Mask underside of crosstube as shown

1-Prime inside and outside crosstube as per QSI 005 4.2

2-Paint outside crosstube with White Imron as per DEO D412-664-243 and QSI 005 4.2

PRIME:

Start Time: 10:00

Finish Time: 11:00

PAINT: 12:23:81

Start Time: 12:45

Finish Time: 1:30

12:07:10 ①
12-7-14

AJ 12-7-14

220

QC14- Inspect Spray Paint

0.00

220

QC

Memo

0.00

Quality Control

Then, Wrap in plastic bag to protect from scratches

8/7/14

| W/O: | | WORK ORDER CHANGES | | | | | |
|------|------|--------------------|----|------|-----|-------------------------------------|--------------------------|
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June-07-12 9:18:12 AM

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Page 6

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Required Date: 21/06/2012 Req'd Qty: 1.00 ***1***

Customer:

Reference:

Approvals: Process Plan: Date:

Tooling: Date:

Run Start ***NR1***

QC: Date:

SPC (Y/N): Date:

Stop ***NR2***

| Sequence ID/ Work Center ID | Operation Description | Set Up/ Run Hours | Tool ID | Tool # | Plan Code | Accept Qty | Reject Qty | Reject Number | Insp. Stamp |
|--------------------------------|--------------------------|----------------------|---------|--------|--------------|---------------|---------------|------------------|----------------|
|--------------------------------|--------------------------|----------------------|---------|--------|--------------|---------------|---------------|------------------|----------------|

230

230

Crosstubes

Crosstubes

Crosstubes

Memo

Assemble as per Dwg D412-664-203

0.00

0.00

1- Install chafing shield as per DEO D412-664-243. Top holes should be facing up.

A/R Proseal 890 Batch: 121287
EXP: 11/12

2- Lightly scuff the bonded area using a 320 grit sand paper and clean the area with 41058 wash 'n' wipe

3- Install support with Scotch-Weld DP460 and install clamps as per DEO Dwg D12-664-243 using installation jig DT9024. Torque clamps as per dwg

A/R Scotch-Weld DP460 Batch: 121968
EXP: 13-4-13

18

12-7-16

240

240

QC

Quality Control

QC5- Inspect part completeness to step on W/O

Memo

0.00

0.00

①

12.07.17

| W/O: | | WORK ORDER CHANGES | | | | | |
|------|------|--------------------|----|------|-----|-------------------------------------|--------------------------|
| DATE | STEP | PROCEDURE CHANGE | By | Date | Qty | Approval Chief Eng / Prod Mgr | Approval QC Inspector |
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NOTE: Date & initial all entries

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Page 7

June-07-12 9:18:12 AM

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Stop ***NS2***

Item Name: Crosstube Aft

Start Date: 07/06/2012 Start Qty: 1.00

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Cust Item ID:

Required Date: 21/06/2012 Req'd Qty: 1.00

1

Customer:

Reference:

Approvals: Process Plan:

Date:

Tooling:

Date:

Run Start ***NR1***

QC:

Date:

SPC (Y/N):

Date:

Stop ***NR2***

Sequence ID/
Work Center ID

Operation
Description

Set Up/
Run Hours

Tool ID

Tool #

Plan
Code

Accept
Qty

Reject
Qty

Reject
Number

Insp.
Stamp

250

Pick Kit

0.00

250

Packaging

Memo

0.00

Packaging

12/2/18 (1)

260

QC4- 100% Inspect kits for completeness

0.00

260

QC

Memo

0.00

Quality Control

DAS 12/4/18

270

Packaging

0.00

270

Packaging

Memo

0.00

Packaging

Identify and pack for shipping as per PPP D412-664-203
*****Ensure tube is not packaged if curing time is less than 12 hrs, see step 27
for application time & date *****
Time & date of packaging: _____
Location: _____

12/2/18 (1)

| W/O: | | WORK ORDER CHANGES | | | | | |
|------|------|--------------------|----|------|-----|-------------------------------------|--------------------------|
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NOTE: Date & initial all entries

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Page 8

June-07-12 9:18:12 AM

Item ID: D412-664-203

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N900040100Setup Start ***NS1***

Revision ID:

Item Name: Crosstube Aft

Stop ***NS2***Start Date: 07/06/2012 Start Qty: 1.00 ***1***

Cust Item ID:

Required Date: 21/06/2012 Req'd Qty: 1.00 ***1***

Customer:

Reference:

Approvals: Process Plan: _____ Date: _____

Tooling:

Date:

Run Start ***NR1***

QC: _____ Date: _____

SPC (Y/N): _____

Date:

Stop ***NR2***Sequence ID/
Work Center IDOperation
DescriptionSet Up/
Run Hours

| Tool ID | Tool # | Plan Code | Accept Qty | Reject Qty | Reject Number | Insp. Stamp |
|---------|--------|-----------|------------|------------|---------------|-------------|
|---------|--------|-----------|------------|------------|---------------|-------------|

280

QC21- Final Inspection - Work Order Release

0.00


280

QC

Memo

0.00

Quality Control

12/7/20 

MLJ 12/07/18

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|------|------|--------------------|----|------|-----|-------------------------------------|--------------------------|
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NOTE: Date & initial all entries

Picklist Print

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Page 1

4

Work Order ID: 85370

85370

Parent Item: D412-664-203

D412-664-203

Parent Item Name: Crosstube Aft

Start Date: 07/06/2012

Required Date: 21/06/2012

Start Qty: 1.00

Required Qty: 1.00

Comments:

IPP Rev:E04.02.16Reformat; Added D3189-1K/DS
 IPP Rev:F 06-03-29 Remove Coments on Pick List JLM
 IPP Rev:G 06.12.08 per ECN 886 EC
 IPP Rev:H 07-04-30 As per Rev D JLM
 IPP Rev:I 08-06-12 add comment in seq. 21 DD verified by:EC IPP rev J
 11.04.21 DEO D412-664-243-E-1 EC verified DD IPP REV:K
 11.10.03 DEO D412-664-243-E-2 DD verf:EC

| Component Item ID/ Item Name | Replacement Item ID | Mfg/ Purch | Bin Item | Primary Location | Last Location | Route Seq ID | Unit of Measure | Qty on Hand | Qty per Kit | Total Qty | Qty Issued | Date Issued | Status |
|---------------------------------|------------------------|---------------|-------------|---------------------|------------------|-----------------|--------------------|----------------|-------------|--------------|---------------|----------------|--------|
|---------------------------------|------------------------|---------------|-------------|---------------------|------------------|-----------------|--------------------|----------------|-------------|--------------|---------------|----------------|--------|

D412-664-203TRN

Manufactured

No

110

Each

2.0000

1

1

**

JW 12-6-12

D412-664-203TRN

Crosstube Turning Detail

Location

Loc Qty

Loc Code

LG

2

83807

1

83808

1

D2896-1

Manufactured

No

230

Each

22.0000

1

1

**

AL 12-7-16

D2896-1

Support

Location

Loc Qty

Loc Code

LG052

8

80586

8

LG053

14

74465

14

D3189-1

Manufactured

No

230

Each

16.0000

2

2

**

AL 12-7-16

D3189-1

Chafing Shield

Location

Loc Qty

Loc Code

FG

4

36065

4

LG053

12

83972

12

| W/O: | | WORK ORDER CHANGES | | | | | |
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NOTE: Date & initial all entries

Picklist Print

June-07-12 9:18:16 AM

Page 2

Work Order ID: 85370

85370

Parent Item: D412-664-203

D412-664-203

Parent Item Name: Crosstube Aft

Start Date: 07/06/2012

Required Date: 21/06/2012

Start Qty: 1.00

Required Qty: 1.00

D3595-063-570

Manufactured No

230

Each

153.0000

2

2

D3595-063-570

RUBBER CUSHION

**

AS 12-7-16

Location

Loc Qty

Loc Code

FG

8

37971

1

42243

7

LG

78

83294

78

MAT052

67

71534

1

76546

66

MS21920-28

Purchased

No

230

Each

71.0000

4

4

MS21920-28

Clamp(per MIL-DTL-8783C)

**

AS 12-7-16

122204

Location

Loc Qty

Loc Code

FG

5

105884

5

LG050

50

116839

2

118713

4

120054

2

121067

42

LG051

16

121440

16

June-07-12 9:18:16 AM

Shop Packet Print

Page 2

| W/O: | | WORK ORDER CHANGES | | | | | |
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June-07-12 9:18:16 AM

Page 3

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Parent Item: D412-664-203

Parent Item Name: Crosstube Aft

85370

D412-664-203

Start Date: 07/06/2012

Required Date: 21/06/2012

Start Qty: 1.00

Required Qty: 1.00

MS21920-30

Purchased

No

230

Each

101.0000

2

2

MS21920-30

clamp(per MIL-DTL-8783C)

**

A8 12-7-16

Location

Loc Qty

Loc Code

LG

38

119529

38

LG051

63

111258

14

121583

49

AN6-40A

Purchased

No

250

Each

156.0000

4

4

AN6-40A

Bolt

**

Location

Loc Qty

Loc Code

ST342

156

120187

66

120833

4

121349

11

121584

25

121827

50

AN6-41A

Purchased

No

250

Each

81.0000

2

2

AN6-41A

Bolt

**

Location

Loc Qty

Loc Code

ST342

81

119749

1

120423

50

121825

30

AN960JD616

NAS1149D0663J

Purchased

No

250

Each

0.0000

18

18

AN960JD616

Washer

**

1121708 6/18

June-07-12 9:18:16 AM

Shop Packet Print

Page 3

| W/O: | | WORK ORDER CHANGES | | | | | |
|------|------|--------------------|----|------|-----|-------------------------------------|--------------------------|
| DATE | STEP | PROCEDURE CHANGE | By | Date | Qty | Approval Chief Eng / Prod Mgr | Approval QC Inspector |
| | | | | | | | |
| | | | | | | | |

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

| NCR: | | WORK ORDER NON-CONFORMANCE (NCR) | | | | | | |
|------|------|----------------------------------|-----------------------------|---------------------------------|----------------|---------------------------|-----------------------|--------------------------|
| DATE | STEP | Description of NC Section A | Corrective Action Section B | | | Verification Section C | Approval Chief Eng | Approval QC Inspector |
| | | | Initial Chief Eng | Action Description Chief Eng | Sign & Date | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

NOTE: Date & initial all entries

Picklist Print

June-07-12 9:18:16 AM

Page 4

Work Order ID: 85370

Parent Item: D412-664-203

Parent Item Name: Crosstube Aft

85370

D412-664-203

Start Date: 07/06/2012

Required Date: 21/06/2012

Start Qty: 1.00

Required Qty: 1.00

MS21042L6

Purchased

No

250

Each

648.0000

6

6

MS21042L6

Nut

**

Location

Loc Qty

Loc Code

ST300

648

117677

25

118384

3

118927

48

119075

372

120308

200

119075

| W/O: | | WORK ORDER CHANGES | | | | | |
|------|------|--------------------|----|------|-----|-------------------------------------|--------------------------|
| DATE | STEP | PROCEDURE CHANGE | By | Date | Qty | Approval Chief Eng / Prod Mgr | Approval QC Inspector |
| | | | | | | | |
| | | | | | | | |

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

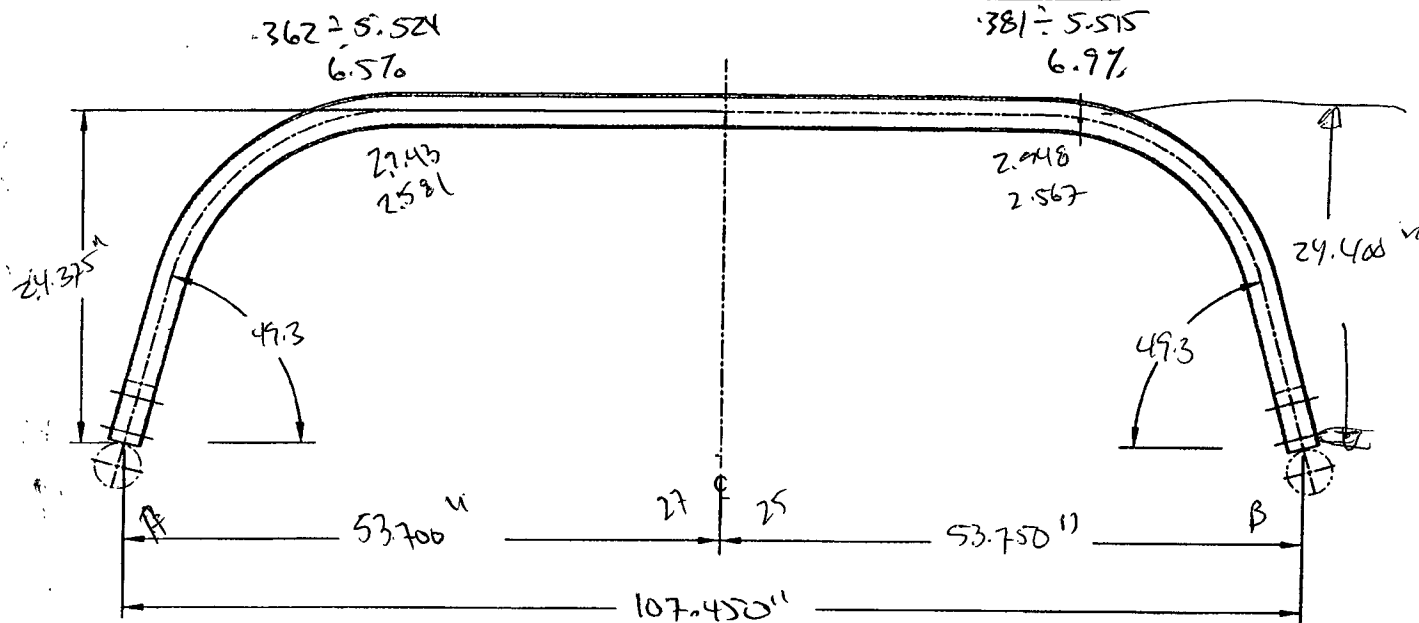
Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

| NCR: | | WORK ORDER NON-CONFORMANCE (NCR) | | | | | | |
|------|------|----------------------------------|-----------------------------|---------------------------------|----------------|---------------------------|-----------------------|--------------------------|
| DATE | STEP | Description of NC Section A | Corrective Action Section B | | | Verification Section C | Approval Chief Eng | Approval QC Inspector |
| | | | Initial Chief Eng | Action Description Chief Eng | Sign & Date | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

NOTE: Date & initial all entries

| | | | |
|--|--|---------------------|--------------------|
| DART AEROSPACE LTD | | Work Order: | 85370 |
| Description: Crosstube High Aft (412) | | Part Number: | D412-664-203 |
| Inspection Dwg: D412-664-243 | | Rev: E | Page 1 of 1 |

| Required Dimension | Min | Max |
|--------------------|--------|--------|
| Height | 24.24 | 24.50 |
| 1/2 Span | 53.59 | 53.85 |
| Angle | 49 | 52 |
| Total Span | 107.18 | 107.70 |



| Comments |
|------------------------------------|
| SIDE A = 6.5% crushing @ 27 Passes |
| SIDE B = 6.9% crushing @ 25 Passes |
| Acceptable @ 12/6/13 |

| | |
|-----------------|----------|
| QC15 Inspection | 8 |
| Date | 12/06/13 |

| Rev | Date | Change | Revised by | Approved |
|-----|----------|-----------------------------------|------------|----------|
| A | 07.02.06 | New Issue | KJ/JM | |
| B | 07.05.08 | Dimensions updated per Dwg rev. D | KJ/JLM | |
| C | 10.02.02 | Dwg Rev updated | KJ | |

| Item | Qty -243 | Part Number | Description |
|------|-------------|----------------|---|
| 1 | X | D412-664-243 | CROSSTUBE ASSEMBLY (412 HIGH AFT) |
| 2 | 1 | D6009-129 | CROSSTUBE |
| 3 | 2 | D3595-063-570 | RUBBER CUSHION |
| 4 | 1 | D2896-1 | SUPPORT |
| 5 | 2 | D3189-1 | CHAFING SHIELD |
| 6 | 2 | D2856-600-1009 | ABRASION STRIP |
| 7 | 4 | MS21920-28 | CLAMP |
| 8 | 2 | MS21920-30 | CLAMP (OR MS21920-32) |
| 9 | A/R | MAGNOBOND 6398 | ROCKWELL SPECIFICATION RBO-120-023 ADHESIVE (TEXTRON/BELL SPEC. 299-947-100, TYPE II, CLASS 2 ADHESIVE) |

GENERAL NOTES:

- MATERIAL: MANUFACTURED FROM D6009-129
FINISHED LENGTH = 124.100±0.020 (BEFORE BENDING/TRIMMING)
- FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
PAINT OUTSIDE PER DART QSI 005 4.2
- TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- UNITS: INCHES UNLESS OTHERWISE NOTED.
- BREAK SHARP EDGES: 0.005 TO 0.010 MAX
- IDENTIFICATION: SCRIBE DART PART NUMBER "D412-664-243" AND BATCH NUMBER ON INSIDE OF CUFF USING VIBRATING STYLUS.
- WEIGHT: 47.0 lbs (PER IIN-D212-664)
- PART IS SYMMETRIC ABOUT CENTERLINE.
- RUN CUTTER OFF PART. BLEND OUT EDGE LONGITUDINALLY. TRANSITION SHOULD BE SMOOTH.
- BEND PROGRESSIVELY WITH A MINIMUM OF 8 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D.
- LIQUID PENETRANT INSPECT OUTSIDE SURFACE OF CROSSTUBE PER QSI 038
- INSTALL D2896-1 SUPPORT USING 0.03" TO 0.06" THICK LAYER OF MAGNOBOND 6398 TO THE SURFACE OF D2896-1 THAT WILL BE IN CONTACT WITH THE CROSSTUBE PER QSI 015. LET CURE FOR 12 HOURS AFTER INSTALLATION AND PRIOR TO PACKAGING.
- INSTALL MS21920-30 CLAMPS (OR -32) WITH D3595-063-570 RUBBER CUSHIONS TO SECURE THE D2896-1 SUPPORT ON TOP SIDE OF THE CROSSTUBE. ENSURE CLAMPS ARE OPPOSITE OF CROSSTUBE SUPPORT
- INSTALL D2856-600-1009 ABRASION STRIPS WITH A 0.13 REF GAP ON BOTTOM SIDE OF CROSSTUBE PER QSI 035.
- EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE.
- TORQUE CLAMPS 80 TO 100 IN.-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.

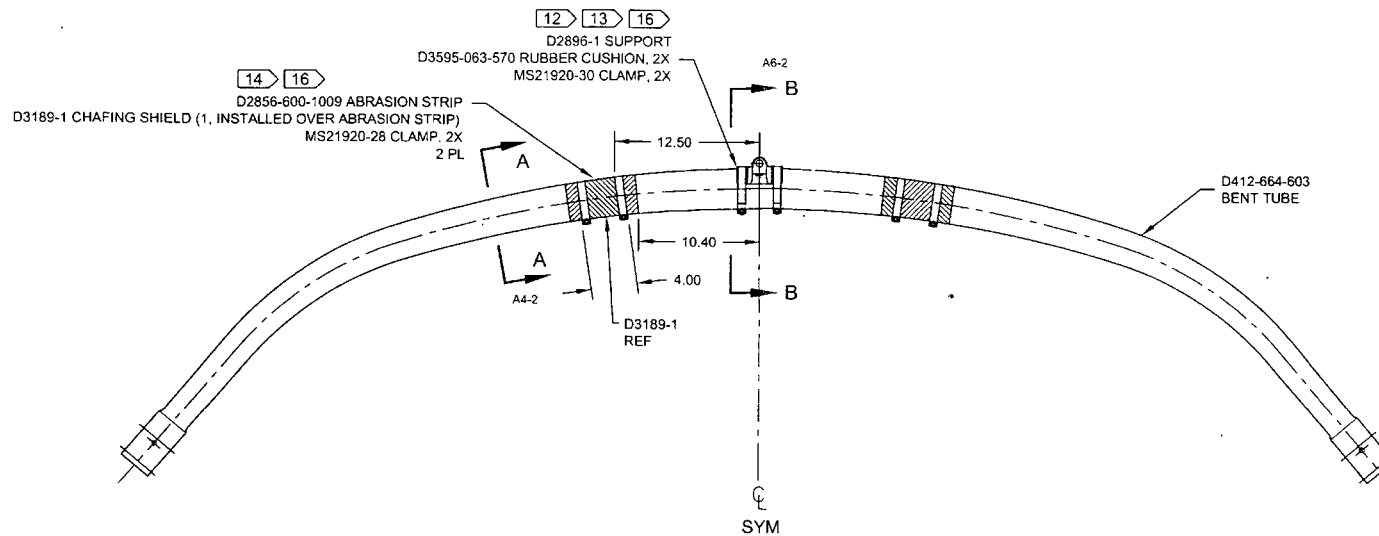
SHOP COPY
RETURN TO
ENGINEERING
UNCONTROLLED COPY
SUBJECT TO AMENDMENT
WITHOUT NOTICE
WORK ORDER
NO. 85370 MCT

12/06/07

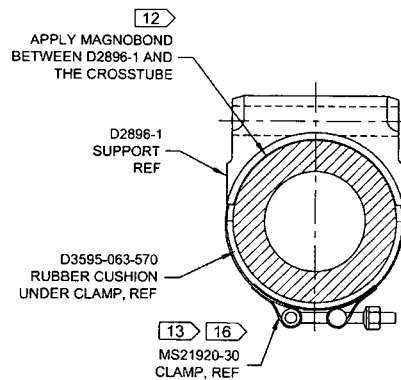
② DEO ATTACHED

RELEASED
2009-10-29

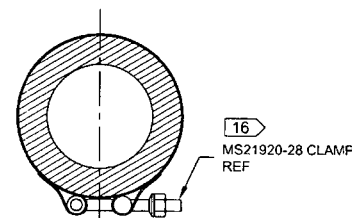
| | | | |
|------------|--|--|----------|
| E | REFORMAT/REVISE GENERAL NOTES; REORGANIZED VIEWS AND REFORMATTED DRAWING TO CURRENT STANDARDS; RELOCATED FLAG #6 PER PAR 08-046 (ZN A6-3), ADD TOLERANCE (ZN B6-3, C4-3, C8-3 & C5-3); MOVED TURNING DETAIL & UPDATED TOLERANCE TO SHEET 4. | RF | 09.09.30 |
| D | REMOVE D2732-058, CHANGE TO D3595-063-570 | PH | 07.03.09 |
| C | REMOVE D2856-600-1087. ADD D2732-058 & MAGNOBOND 6398. MS21920-32 WAS MS21920-30 | MB | 06.10.27 |
| B | ADD HOLES FOR COMPATABILITY WITH BHT/AA SKIDTUBES | PH | 05.02.04 |
| A | NEW ISSUE | PH | 01.10.17 |
| REV. | DESCRIPTION | BY | DATE |
| DESIGN | PH | DART AEROSPACE LTD HAWKESBURY, ONTARIO, CANADA DRAWING NO. REV. E D412-664-243 SHEET 1 OF 4 TITLE SCALE CROSSTUBE ASSEMBLY (412 HI AFT) NTS COPYRIGHT © 2001 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD | |
| DRAWN | RF | | |
| CHECKED | PH | | |
| MFG. APPR. | PH | | |
| APPROVED | PH | | |
| DE APPR. | PH | | |
| DATE | 09.09.30 | | |



D212-664-243
ASSEMBLY DETAIL



SECTION B-B D4-2
SCALE 4X

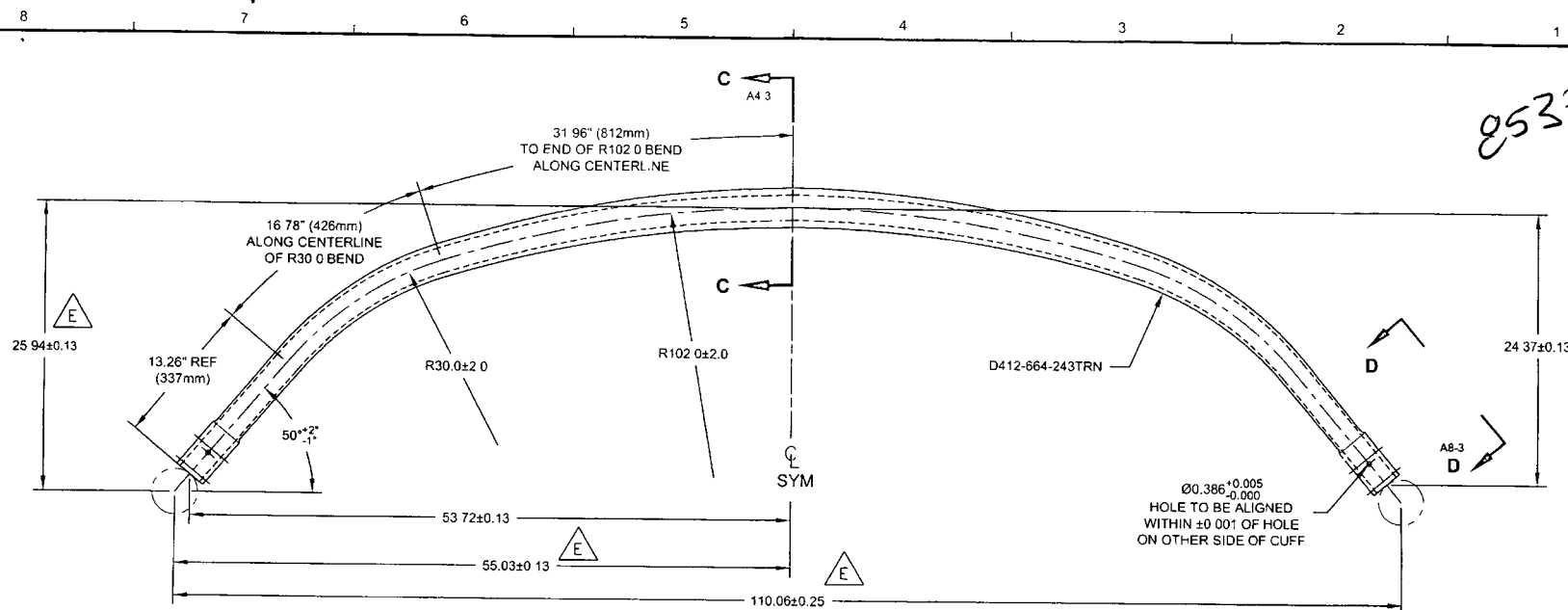


SECTION A-A C6-2
SCALE 4X

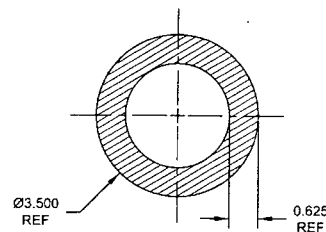
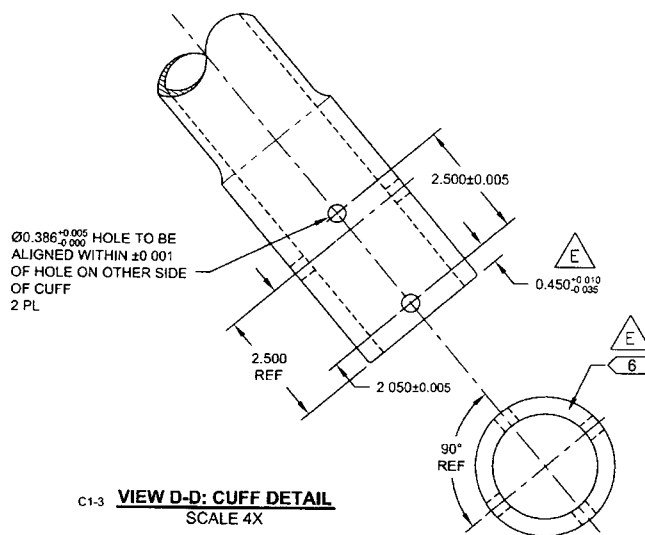
2 DEO ATTACHED

RELEASED
2009-10-28

| | | | |
|------------|----------|--|--------------|
| DESIGN | PH | DART AEROSPACE LTD | |
| DRAWN | RF | HAWKESBURY, ONTARIO, CANADA | |
| CHECKED | PS | DRAWING NO. | REV. E |
| MFG. APPR. | PS | D412-664-243 | SHEET 2 OF 4 |
| APPROVED | PS | TITLE | SCALE |
| DE APPR. | PS | CROSSTUBE ASSEMBLY (412 HI AFT) | NTS |
| DATE | 09.09.30 | <small>COPYRIGHT © 2001 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.</small> | |



D412-664-603 10
BENDING AND DRILLING DETAIL E



② DEO ATTACHED
RELEASED
 2009-10-29
 MP

| | | | |
|-----------|----------|---|--------------|
| DESIGN | PH | DART AEROSPACE LTD | |
| DRAWN | RF | HAWKESBURY, ONTARIO, CANADA | |
| CHECKED | Q | DRAWING NO. | REV. E |
| MFG APPR. | DS | D412-664-243 | SHEET 3 OF 4 |
| APPROVED | AP | TITLE | SCALE |
| DE APPR. | H | CROSSTUBE ASSEMBLY (412 HI AFT) | NTS |
| DATE | 09.09.30 | COPYRIGHT © 2001 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD | |

| | | | | | | | |
|-----------------------------|--|---------------------|---|-------------------|--------------------------------|---------------------------|--------------|
| DRAWING NO. D412-664-243 | TITLE CROSSTUBE ASSEMBLY (412 HI AFT) | REV. E | DART AEROSPACE LTD ENGINEERING ORDER | | D.E.O. NO. D412-664-243-E-1 | SHEET NO. SHEET 1 OF 2 | SCALE NTS |
| DRAWN | CHECKED <i>MP</i> | MFG. APPR. <i>E</i> | APPROVED <i>MP</i> | DE APPR. <i>H</i> | | | |
| DATE 11.03.31 | DATE 11/03/31 | DATE 11.03.31 | DATE 11/03/31 | DATE 11-03-31 | | | |

25370

PURPOSE:

REMOVED ABRASION STRIP IN FAVOR OF A THIN LAYER OF PROSEAL 890.

CHANGE:

PARTS LIST IS AMENDED AS FOLLOWS:

IS:

| Item | Qty -243 | Part Number | Description |
|------|-------------|----------------|----------------|
| 6 | 0 | D2856-600-1009 | ABRASION STRIP |

WAS:

| | | | |
|---|---|----------------|----------------|
| 6 | 2 | D2856-600-1009 | ABRASION STRIP |
|---|---|----------------|----------------|

NOTES 2 AND 14, SHEET 1 ARE AMENDED AS FOLLOWS:

IS:

- 2) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
MASK UNDERSIDE OF CROSSTUBE AS SHOWN (HATCHED AREA)
PAINT OUTSIDE PER DART QSI 005 4.2
AFTER PAINTING, APPLY CLEAR COAT ON HATCHED AREA
- 14) APPLY A THIN COAT OF PROSEAL 890 ON INSIDE CONCAVE SURFACE OF D3189-1
CHAFING SHIELD AND LET CURE PER MANUFACTURER'S INSTRUCTIONS. INSTALL
PROSEALED D3189-1 CHAFING SHIELD ONTO CROSSTUBE BY APPLYING A THIN COAT OF
PROSEAL 890 ONTO CROSSTUBE. BE SURE TO ELIMINATE ANY AIR GAPS.

WAS:

- 2) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
PAINT OUTSIDE PER DART QSI 005 4.2
- 14) INSTALL D2856-600-1009 ABRASION STRIPS WITH A 0.13 REF GAP ON BOTTOM SIDE OF
CROSSTUBE PER QSI 035.

RELEASED
2011-04-07
MP

| | | | | | | | | | | | | | |
|-----------------------------|--|--|--|---------------|--|---|--|--------------------------------|--|---------------------------|--|--------------|--|
| DRAWING NO. D412-664-243 | | TITLE CROSSTUBE ASSEMBLY (412 HI AFT) | | REV. E | | DART AEROSPACE LTD ENGINEERING ORDER | | D.E.O. NO. D412-664-243-E-1 | | SHEET NO. SHEET 2 OF 2 | | SCALE NTS | |
| DRAWN | | CHECKED | | MFG. APPR. | | APPROVED | | DE APPR. | | | | | |
| DATE 11.03.31 | | DATE 11.03.31 | | DATE 11.03.31 | | DATE 11.03.31 | | DATE 11.03.31 | | | | | |

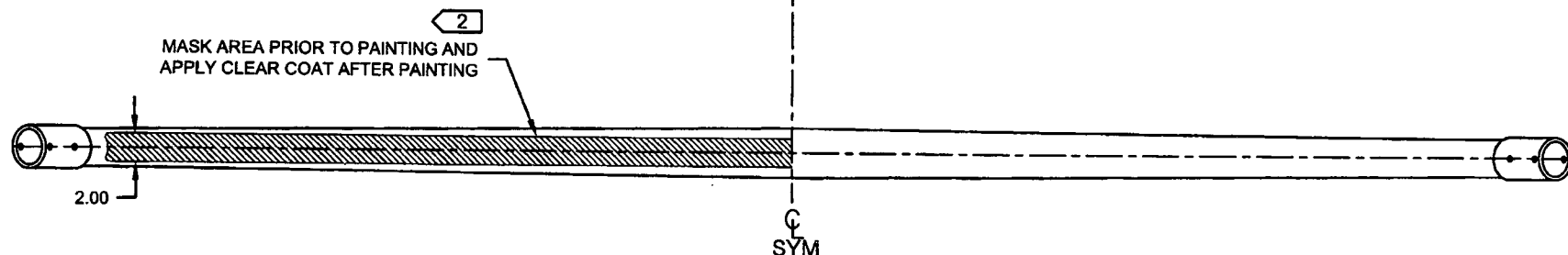
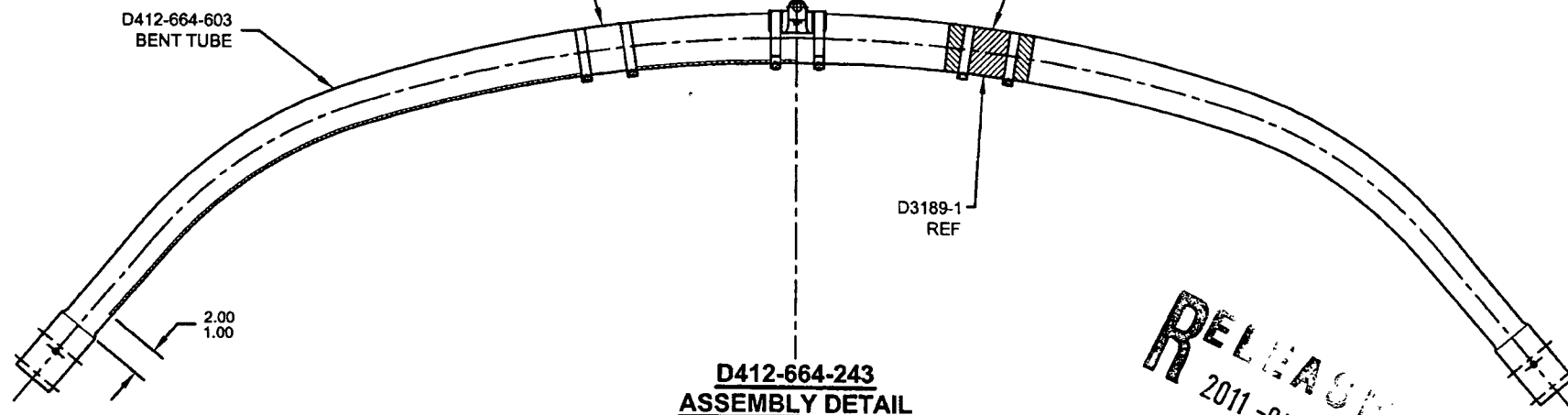
85370

IS:

D3189-1 CHAFING SHIELD (1, INSTALLED OVER PROSEAL 890)
MS21920-28 CLAMP, 2X
2 PL

WAS:

D2856-600-1009 ABRASION STRIP
D3189-1 CHAFING SHIELD (1, INSTALLED OVER ABRASION STRIP)
MS21920-28 CLAMP, 2X
2 PL



| | | | | | | | |
|-----------------------------|---------------------------------------|------------------|---|--|--------------------------------|---------------------------|--------------|
| DRAWING NO. D412-664-243 | TITLE CROSSTUBE ASS'Y (412 HI AFT) | REV. E | DART AEROSPACE LTD ENGINEERING ORDER | | D.E.O. NO. D412-664-243-E-2 | SHEET NO. SHEET 1 OF 1 | SCALE NTS |
| DRAWN 97 | CHECKED ASS | MFG. APPR. E | APPROVED MP | | DE APPR. H | | |
| DATE 11.09.07 | DATE 11.09.19 | DATE 11.09.19 | DATE 11.09.19 | | DATE 11.09.19 | | |

PURPOSE:

REPLACE MAGNOBOND WITH 3M DP460 SCOTCH-WELD EPOXY ADHESIVE

CHANGE:

IS:

| Item | Qty -243 | Part Number | Description |
|------|-------------|-------------------|--------------------------------|
| 9 | A/R | SCOTCH-WELD DP460 | EPOXY ADHESIVE, 3M SCOTCH-WELD |

WAS:

| | | | |
|---|-----|----------------|---|
| 9 | A/R | MAGNOBOND 6398 | ROCKWELL SPECIFICATION RBO-120-023 ADHESIVE (TEXTRON/BELL SPEC. 299-947-100, TYPE II, CLASS 2 ADHESIVE) |
|---|-----|----------------|---|

NOTE 12 & 16, SHEET 1 IS AMENDED AS FOLLOWS:

IS:

- 12) INSTALL D2896-1 CENTER SUPPORT USING A 0.04" TO 0.07" THICK LAYER OF SCOTCH-WELD DP460 PER QSI 015. LET CURE FOR 24 HOURS AFTER INSTALLATION AND PRIOR TO PACKAGING.
- 16) TORQUE CLAMPS 80 TO 100 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING. **PRIOR TO PACKAGING, RE-CHECK TORQUE ON CLAMPS AFTER ADHESIVE HAS CURED FOR 24 HOURS.**

WAS:

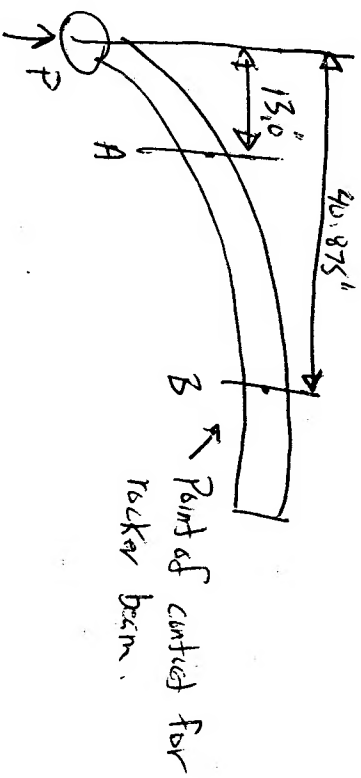
- 12) INSTALL D2896-1 SUPPORT USING 0.03" TO 0.06" THICK LAYER OF MAGNOBOND 6398 TO THE SURFACE OF D2896-1 THAT WILL BE IN CONTACT WITH THE CROSSTUBE PER QSI 015. LET CURE FOR 12 HOURS AFTER INSTALLATION AND PRIOR TO PACKAGING.
- 16) TORQUE CLAMPS 80 TO 100 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.

RELEASED
2011-09-29
MP

CRUSHING OF D412-664-243

11.12.06

Acceptability of 8% CRUSHING AT END OF BEND



For Δ : $\Delta D_1 = 2.961$, $\Delta D_2 = 2.522$

$$CRUSHING = (2.961 - 2.522) / (2.961 + 2.522) = 8\%$$

$$I = 1.676 \text{ in}^4 \text{ (from AutoCAD)}$$

For Δ : $\Delta D_1 = 3.307$, $I = 4.613 \text{ in}^4$

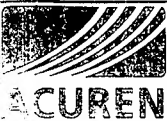
Δ : $F = M_c / I = P \times 13 \times 2.961 / 2 \times 1.676 = 11,484.6 \cdot P$

Δ : $= P \times 40.875 \times 3.307 / 2 \times 4.613 = 14,651 \cdot P$

M.S. = $14,651 / 11,484 - 1 = 0.27$

\therefore Tube will break at rocker beam contact before area of 8% crushing, 8% crushing in area at end of tube band is acceptable

11.12.06



LIQUID PENETRANT TEST REPORT

P- 12185

PAGE 1 OF 1

DATE 06/19/2012 TIME AM ☒ PM 12:05
ACUREN JOB NO. 188-12-0265
PO/NO. 17258
WORK LOCATION Same
ACCEPTANCE STD. ASME 1417/01-038 REV./DATE 2005
PROJECT F.P.I. ON CROSS TUBES
ITEM(S) EXAMINED SEE RESULTS

JOB DESCRIPTION CROSS TUBES PROCEDURE NO. LT-002 REV./DATE 2008 TECHNIQUE NO. LT-002 REV./DATE 2008
PART NO. CROSS TUBES - SEE RESULTS MATERIAL Aluminum THICKNESS 1/4"
SCOPE A DET FLUORESCENT LIQUID PENETRANT INSPECTION WAS
CARRIED OUT ON THE 100% EXTERNAL SURFACE.

TEST DETAILS
METHOD ☒ FLUORESCENT ☐ VISIBLE ☒ WATER WASH ☐ SOLVENT REMOVABLE ☐ POST EMULSIFIER
WASH FLUX US-2A FLUX BLACK LIGHT S/N 16459 OUTPUT > 1000 μ W/cm² AMBIENT < 27°
EYE 2467 MINIMUM DWELL TIME 45 MIN. LIGHTING EQUIP. ☐ FLASHLIGHT ☐ TROUBLELIGHT ☐ OUTPUT > 100 fc @ SURF
REMOVER H2O MINIMUM DRY TIME > 10 MIN. OTHER LABINO
EYE SKD 52 MINIMUM DWELL TIME 10 MIN. LIGHT METER S/N 1098866 CAL DUE DATE 2-19-2012
DEVELOPER ☒ NON AQUEOUS ☐ AQUEOUS ☐ DRY

TEST SURFACE
SURFACE CONDITION ☐ AS GROUND ☐ AS WELDED ☒ MACHINED ☐ SHOT BLASTED ☒ CLEAN BARE METAL
SURFACE TEMPERATURE ☐ < -4°C/20°F ☐ -4°C/20°F TO 10°C/50°F ☒ 10°C/50°F TO 52°C/125°F ☐ > 52°C/125°F

RESULTS- (☐ METRIC ☐ IMPERIAL)
CROSS TUBES
W.O. =

| | | |
|---|-------|---|
| 1 | 85369 | ✓ |
| 1 | 85371 | ✓ |
| 1 | 85370 | ✓ |
| 1 | 85368 | ✓ |

- REGRIND - 1 TIME

10/12/06/19

Scope of Services
The agreement of Acuren Group Inc. to perform services extends only to those services provided for in writing. Under no circumstances shall such services extend beyond the performance of the requested services. It is expressly understood that all descriptions, comments and expressions of opinion, reflect the opinions or observations of Acuren Group Inc. based on information and assumptions supplied by the owner/operator and are not intended nor can they be construed as representations or warranties. Acuren Group Inc. is not assuming any responsibilities of the owner/operator and the owner/operator retains complete responsibility for the engineering, manufacture, repair and use decisions as a result of the data or other information provided by Acuren Group Inc. In no event shall Acuren Group Inc.'s liability in respect of the services referred to herein exceed the amount paid for such services.

Standard of Care
In performing the services provided, Acuren Group Inc. uses the degree, care and skill ordinarily exercised under similar circumstances by others performing such services in the same or similar locality. No other warranty, expressed or implied, is made or intended by Acuren Group Inc.

SIGNATURES
CLIENT REPRESENTATIVE Matthew Murdoch PRINT Matthew Murdoch SIGNATURE
TECHNICIAN (SIGNATURE): Mike Lutz 1ST TECHNICIAN Mike Lutz 2ND TECHNICIAN
NAME (PRINT): Mike Lutz CGSB LEVEL II SNT LEVEL II CGSB REG. NO. 6606
DTR # E-63501
REPORT REVIEWED BY: E-63501
NAME INITIALS

WHITE - CLIENT COPY

CANARY - OFFICE COPY

PINK - TECHNICIAN COPY

GOLD - OFFICE COPY

PT Sep: 2011

5.0 PARTS LIST

5.1 HIGH GEAR CROSSTUBES

| Item | -101 | -201 | -203 | Part Number | Description |
|------|------|------|------|-----------------|--|
| | X | | | D212-664-101 | CROSSTUBE INSTALLATION, 204/205/210/212/214/412, UH-1H, UH-1A/B/E/F/L/P, TH-1F/L, HH-1K HIGH FWD |
| | | X | | D212-664-201 | CROSSTUBE INSTALLATION, 204/205/210/212/214, UH-1H, UH-1A/B/E/F/L/P, TH-1F/L, HH-1K HIGH AFT |
| | | | X | D412-664-203 | CROSSTUBE INSTALLATION, 412 HIGH AFT |
| 1 | 1 | | | D212-664-141 | CROSSTUBE ASSEMBLY, 204/205/210/212/214/412, UH-1H, UH-1A/B/E/F/L/P, TH-1F/L, HH-1K HIGH FWD |
| 2 | | 1 | | D212-664-241 | CROSSTUBE ASSEMBLY, 204/205/210/212/214, UH-1H, UH-1A/B/E/F/L/P, TH-1F/L, HH-1K HIGH AFT |
| 3 | | | 1 | D412-664-243 | CROSSTUBE ASSEMBLY, 412 HIGH AFT |
| 10 | 2 | | | * D2893-1 | SUPPORT |
| 11 | 4 | | | * D3595-063-450 | RUBBER CUSHION |
| 12 | 4 | | | * MS21920-25 | CLAMP (OR MS21042-26) |
| 13 | 4 | | | AN6-35A | BOLT |
| 14 | 4 | | | AN6-36A | BOLT |
| 15 | 6 | | | MS21042L6 | NUT (OR MS21042-6) |
| 16 | 18 | | | AN960JD616 | WASHER |
| 20 | | 2 | | * D2940-1 | SUPPORT |
| 21 | | 4 | | * D3595-063-530 | RUBBER CUSHION |
| 22 | | 4 | | * MS21920-28 | CLAMP (OR MS21042-30) |
| 23 | | 4 | | AN6-40A | BOLT |
| 24 | | 2 | | AN6-41A | BOLT |
| 25 | | 6 | | MS21042L6 | NUT (OR MS21042-6) |
| 26 | | 18 | | AN960JD616 | WASHER |
| 30 | | | 1 | * D2896-1 | SUPPORT |
| 32 | | | 2 | * D3595-063-570 | RUBBER CUSHION |
| 33 | | | 4 | * MS21920-28 | CLAMP |
| 34 | | | 2 | * MS21920-30 | CLAMP (OR MS21042-32) |
| 35 | | | 4 | AN6-40A | BOLT |
| 36 | | | 2 | AN6-41A | BOLT |
| 37 | | | 6 | MS21042L6 | NUT (OR MS21042-6) |
| 38 | | | 18 | AN960JD616 | WASHER |
| 39 | | | 2 | * D3189-1 | CHAFING SHIELD |
| 50 | 1 | 1 | | D3428-1 | PLACARD |

* REFERENCE ONLY. PARTS ARE INCLUDED IN D212-664-141/-241 OR D412-664-243 ASSEMBLIES ABOVE
 NOTE: KITS INCLUDE EXTRA HARDWARE FOR COMPATIBILITY WITH BOTH DART AND BELL/AAI
 SKIDTUBES.